

Notes on the fruit and seed of *Homalanthus* (Euphorbiaceae)

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ABSTRACT

The structure of the fruit and seed is described for *Homalanthus populifolius* of Australia and for two species with comparatively robust capsules, *H. polyandrus* of the Kermadec Islands and *H. trivalvis* of Melanesia. The fruit of *H. repandus* of New Caledonia differs from all others so far documented in the genus in being a baccate schizocarp, i.e., a somewhat fleshy, septicidally dehiscent capsule, composed of three mericarps.

RÉSUMÉ

Notes sur le fruit et la graine de Homalanthus (Euphorbiaceae).

MOTS CLÉS
Homalanthus,
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fruit,
graine,
morphologie,
flore de la Nouvelle-Calédonie.

La structure du fruit et de la graine est décrite pour *Homalanthus populifolius* d'Australie ainsi que pour deux espèces ayant des capsules plus robustes, *H. polyandrus* des îles Kermadec et *H. trivalvis* de Mélanésie. Le fruit de *H. repandus* de Nouvelle-Calédonie diffère de ceux des autres espèces étudiées pour ce genre, étant un schizocarpe bacciforme, c'est-à-dire une capsule assez charnue, à déhiscence septicide, composée de trois méricarpes.

INTRODUCTION

Homalanthus (sometimes spelt *Omalanthus*; has been proposed for conservation: ESSER 1996), an Old World genus of twenty or so species of secondary-growth trees and treelets, has a natural distribution that extends from southern Thailand and the Philippines southeast to Australia, New Caledonia and the Kermadec Islands, and from there across the Pacific to the Austral and Society Islands (PAX & HOFFMAN 1912; MCPHERSON & TIREL 1987; FLORENCE 1997). It is a well-defined genus within the tribe Hippomaneae; its probable autapomorphies are its large bud-covering stipules, papillate ovary, stigmatic glands and bilateral calyx (ESSER 1997). Principally because of the stipule and calyx characters *Homalanthus* has been placed in a subtribe of its own, the Carumbiinae (WEBSTER 1994; ESSER, VAN WELZEN & DJARWANINHIH 1997).

The genus in Malesia and the Solomon Islands has been revised by ESSER (1997), and the thirteen species he recognizes in this area encompass much of the variation in the genus (PAX & HOFFMAN 1912; GARDNER unpubl. data). In discussing characters useful at the specific level ESSER (1997) noted that some species are distinguished by the morphology of the fruit, and sometimes also by the size of the seed aril, though unfortunately the latter structure is difficult to assess in dried material. The present article provides some additional information on the fruit and seed in some members of the genus, notably the New Caledonian *Homalanthus repandus* Schltr.

MATERIALS AND METHODS

Herbarium material from AK, CHR, K, NOU and P was studied, as were live plants of *Homalanthus polyandrus* (cultivated) and *H. populifolius* (naturalised) that were growing in Auckland, New Zealand. Living plants of *H. repandus* were observed in New Caledonia in 1996.

STRUCTURE OF FRUIT AND SEED

In female *Homalanthus* flowers the ovary

locules, positioned below the styler arms ("stigmatic branches" of some authors), each contain only a single seed. ESSER (1997) found that the Malesian taxa he studied were either 2-locular or 3-locular, with only occasional departure from the norm, but could not find any correlated variation in fruit or seed structure. The following notes on fruit and seed in four species of the genus increase the known range of variation in these organs.

Homalanthus populifolius Graham

This species is found naturally in the Solomon Islands and Australia. Its capsule is medium-sized, with a wall that is neither particularly thick nor thin, and in these respects the species can be taken as being typical of the genus at large (ESSER 1997; R.O. GARDNER unpubl. data). Capsules and seeds are shown in Fig. 1A.

The ovary is almost always 2-locular. The course of fruit-ripening (as observed in New Zealand, where the species is widely naturalized) is as follows. The pedicels, recurved from the time of flowering, elongate without change in direction to direct the fruit out and downwards. The two valves of the immature capsule are glaucous-green and weakly papillose, and when damaged exude abundant white latex from the thin mesocarp. The styles, as is almost invariable in the genus, are persistent. The enlarging seed is already partly covered by a funicular aril, pale at this stage. The other notable feature of the seed is the distinctly papillose nature of the translucent outermost layer of the seedcoat, i.e., the testa (in the terminology of CORNER 1976).

During autumn and early winter (April-July), the pedicel, valves and styles become crimson-coloured. The valves lose their latex and otherwise dry out, and the thin endocarp becomes somewhat cartilaginous. At full fruit ripeness, the valves become free from one another along the locular plane, where the dorsal vascular strands run. The valves are fully loose around the base of the columella. At the apex they may at first be weakly connected to each other by vascular tissue that runs up into the style; soon though they fall away, singly or together, to expose the two mature seeds pendent from the columella apex. The

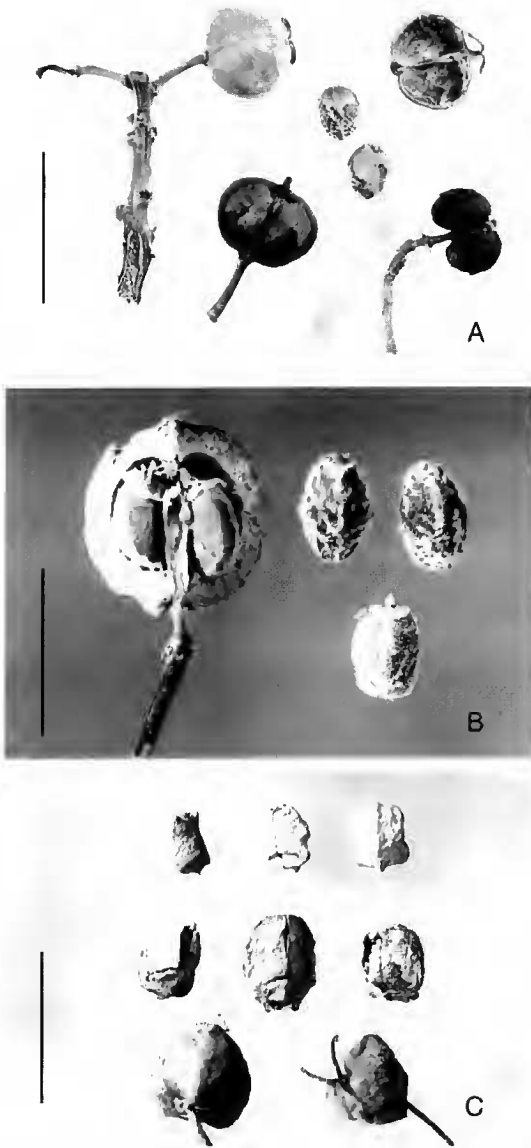


Fig. 1.—*Homalanthus*, fruit and seeds. All dried material. Scale bars equal 1 cm. **A**, *H. populifolius*: Intact capsule, interior of valves of dehiscent capsule, pair of seeds attached at top of columella (note aril), seeds (uppermost seed showing dorsal aspect). Based on Gardner 8497 (AK); **B**, *H. trivalvis*: Broken-open (but almost mature) capsule, showing two of its three seeds, backed by one very woody valve. Seeds (upper ones showing ventral aspect, lower one showing dorsal aspect) with small aril, and notably papillose testa. Based on Craven & Schodde 13 (CANB); **C**, *H. repandus* (from below upwards): ripe capsules (somewhat ridged as the flesh contracts around the mericarps); mericarps (broken free from one another by hand) — note the “basal triangle”; seeds (left-hand one showing dorsal aspect). Based on Gardner 7988 (AK).

seeds are broadly ellipsoid, ca. 6 mm long and 4.5 mm diam., and are covered in their upper two-thirds by a bright yellow, deeply lacerate, papillose-margined aril. The testa is now seen as a translucent very thin layer outside the hammer-marked, darkly sclerified inner seedcoat (tegmen). The testa is distinctly short-papillose ($\times 10$ lens) when the ripe fruit first opens, but then shrinks to form a cobwebby reticulum, and its nature is quite obscure in dried or rehydrated material.

The observations presented above agree with those of CORNER (1976) on the Malesian species *H. populneus* (Geiseler) Pax, although that author did not report a papillose testa nor a well-developed aril. According to ESSER (1997), however, the upper half of the seed in this species is “enveloped by [an] arillode”. The conflicting observations of these two authors remain to be reconciled.

***Homalanthus trivalvis* Airy Shaw and *H. polyandrus* Cheeseman**

The fruits in these species are trilocular, and (with regards to both the trilocular-fruited species and the genus as a whole) are comparatively large and thick-walled (ESSER 1997). *Homalanthus trivalvis*, distributed in Bougainville and the Solomon Islands, has a capsule of ca. 13 mm diam. Its valves are ca. 1.5 mm thick and consist mostly of very hard sclerified endocarp — immature fruit cannot be squeezed open in one’s fingers. ESSER (1997) indicates that the fruit does open “regularly and loculicidally” but also notes that it may open “hardly along the septa”. The single specimen of this species available to me showed no such secondary line of weakness in the valves.

Nor was I able to confirm the statement of ESSER (1997) that the seed is “totally covered in an arillode”; rather, the aril was seen as a button at the seed apex. The testa however was conspicuous, being densely clothed in pale hair-like papillae ca. 0.2 mm long. Since in herbarium material fleshy seedcoats and arils are often distorted, partially fused to each other or to the capsule wall, or obscured and damaged by fungal growths, a confusion between these two structures may sometimes arise.

Fruit and seeds of *H. trivalvis* are shown in Fig. 1B.

Homalanthus polyandrus is endemic to the Kermadec Islands, ca. 970 km northwest of the New Zealand mainland. Its fruit are about as large as those of *H. trivalvis* and are mostly 3-locular (SYKES 1969), although examples of the 4-locular condition are not infrequent (AK, CHR!). The seeds however are not especially large, being of about the same size as those of *H. populifolius*.

The fruit owes its "extra" size to the thickness of its valves. Externally the valves are somewhat rugose and obscurely papillose, and, before they redden, dry somewhat and fall, they are ca. 2 mm thick and consist mostly of rather leathery, somewhat lactiferous mesocarp. The mature seeds are almost entirely covered in a yellowish lacerate aril, and the testa (just before it dries out) is almost smooth rather than distinctly papillose.

It may be that these fruits provide a rather weak example of "island gigantism", with respect to the increased number of locules. But also relevant are some field observations of SYKES (1969: 306), who found it difficult to collect and study ripe fruit of *H. polyandrus* in the Kermadec Islands because the tui, *Prosthemadera novaeseelandiae*, a medium-sized native honey-eater bird omnivorous in its diet, was "attacking the flowers and fruit". SYKES (1969) also stated that the fruit often broke up as soon as it fell to the ground, but it is not clear whether such fruit-fall is the usual mode of dispersal (it was noted in the Malesian species by ESSER (1997) only for the single species *H. giganteus* Zoll. & Moritz), or whether this was just ripe fruit being scattered by birds. At any rate, it can be speculated that the thickened, fruit walls of this species, and the woody nature of the walls in *H. trivalvis*, may both be counteradaptations to seed predation by birds.

***Homalanthus repandus* Schltr.**

This species is endemic to New Caledonia, being fairly widespread there at lower and middle altitudes, apparently mostly on soils derived from

geological substrates other than ultramafics — see the distribution map of MCPHERSON & TIREL (1987). Its ripe fruits are "medium-sized" (ca. 8 mm diam. in life) and are 3-locular. They are described by MCPHERSON & TIREL (1987) as being indehiscent capsules, as are the other two species of this island, *H. nutans* (G. Forst.) Guill. and *H. schlechteri* Pax & Hoffm. This is correct for these latter species (pers. obs.), but the fruit of *H. repandus* is very different. It conforms to one of the common euphorbiaceous types, being a fleshy-walled capsule with three mericarps that eventually loosen from one another along the septic. The mericarp walls are thinly cartilaginous, and the two inner faces split low down to form a structure resembling the "basal triangle" that was noted by ESSER, VAN WELZEN & DJARWANINHIH (1997) in the mericarps of some other (dry-capsular) members of the Hippomaneae in Malesia. The seed of *H. repandus* bears only a small aril at its apex and the testa is papillose.

Ripe fruit, mericarps and seeds of *H. repandus* are shown in Fig 1C.

With regard to dehiscence of the *Homalanthus* capsule, ESSER (1997) stated (p. 424) that these "open loculicidally, usually not along the septa", but in his generic and species descriptions there is no indication that septicidal dehiscence is ever more than an occasional irregularity (or artefact?). In my observations on the fruits of more than half the number of species found in Malesia, Australia and the Pacific I have not seen septicidally dehiscent fruit in any species other than *H. repandus*.

CONCLUSION

The presence is shown of a baccate septicidally dehiscent schizocarp in a species of *Homalanthus*, a fruit type previously undocumented in the genus. The existence of this feature, and of some others of the fruit and seed elsewhere in the genus (for example, a papillose testa), shows that study of the detailed morphological character of these organs, though often difficult to do from dried material alone, can yield valuable taxonomic data (cf. GARDNER 1996).

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